

Honed Technologies Carefully Responding to Automotive Needs Advanced Devices with Full Use of Microfabrication also Available Panasonic's Automotive Sensors Increase Presence

In the electric and electronic devices fields, there is no end to the pursuit of more sophisticated functions and performance. Amid such efforts, the needs for sensors are increasing at cutting-edge development sites as new requirements for various usages keep emerging. Panasonic draws attention as a supplier that provides advanced devices to meet these needs. The company shows significant presence in the markets of temperature sensors and gyro sensors for automotive applications and also offers various products with unique features such as pressure sensors and infrared array sensors that make full use of microfabrication technologies.

Among numerous electronic devices, sensors, which are used to acquire various information, are gaining prominent attention from device designers. One reason is the concept of the Internet of Things (IoT) spreading among factories, buildings, and cities. Another reason is the increase in the number of electronic devices that adopt new sensors to achieve sophisticated electronic control. Panasonic has a wide choice of sensors to quickly respond to these needs. Here, this column introduces temperature sensors and gyro sensors for automotive applications, which are showing an especially significant presence in the automotive market.

Process Technologies and Customized Response

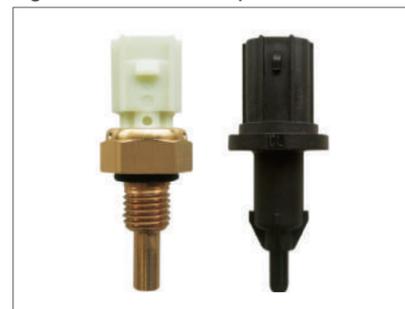
Panasonic's automotive temperature sensors are roughly grouped into two types: liquid temperature sensors and air temperature sensors (Fig. 1). Liquid temperature sensors are used in systems that monitor the temperature of engine cooling fluid and oil in motorcycles and four wheelers. Panasonic's products have a dominant share in the market for motorcycles.

Making use of the technologies and expertise cultivated in the motorcycle market, Panasonic has been actively tapping into the temperature sensor market for four wheelers. Efficient energy consumption is a major issue in vehicle development. Temperature sensors are required as part of various approaches toward solving this problem. The company intends to capture a market share by carefully responding to such needs. They are also focusing as much effort on air temperature sensors used for air conditioner control, etc. Panasonic's strength lies in their expertise of optimizing functions and performance in accordance with users' needs while making full use of process technologies such as molding, structure design, and mold design. Careful response to the needs of manufacturers that have their own particular requirements will win new customers. Panasonic is also making efforts to reduce the size and weight of temperature sensors for users who work on the weight reduction of their products with the aim of improving fuel efficiency.

Highly-evaluated Thin Film Technology

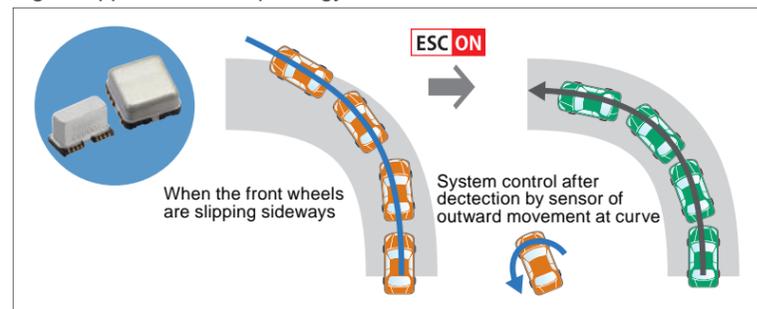
Gyro sensors detect the rotation of objects (Fig. 2). They are used in many vehicle systems that ensure safety while travelling such as electronic stability control systems and rollover detection systems, as well as the autonomous navigation system of car navigation systems and the autonomous navigation system of vacuum cleaning robots. Panasonic offers a product portfolio that allows wide choices with a variety of models such as those detecting x-axial

Fig. 1. Automotive temperature sensors



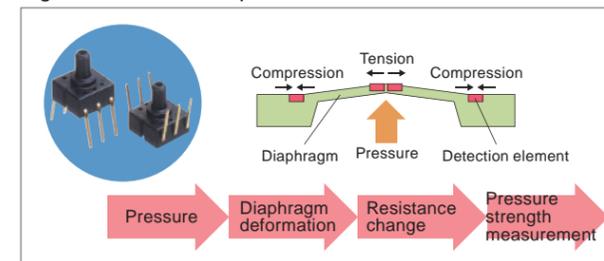
Liquid temperature sensor (left)
Air temperature sensor (right)

Fig. 2. Application example of gyro sensors



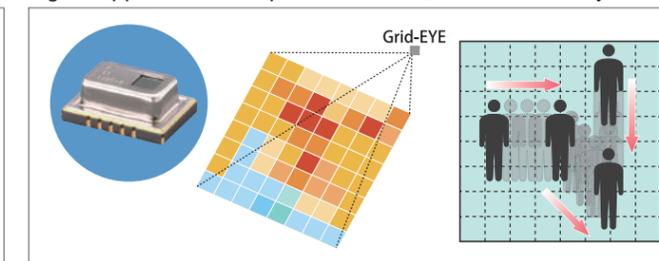
A gyro sensor detects the turning speed of the vehicle to prevent sideways slip.

Fig. 3. Mechanism of pressure sensors



Detects changes of a diaphragm due to pressure as resistance changes of the detection element and measures the pressure strength.

Fig. 4. Application example of Grid-EYE, an infrared array sensor



Detects the positions and number of people based on signals acquired from the array sensor.

and z-axial rotations respectively. This allows users to quickly obtain products in accordance with their needs. All these products are highly precise and also highly reliable to be able to withstand severe conditions in terms of temperature, humidity, and vibration.

The key to achieving these features is a thin film mass-production technology required to manufacture very small elements integrated in the heart of the products. This technology is highly evaluated in the industry. In 2011, it won the Contribution Prize of the Ichimura Industrial Prize, which is awarded to an individual or a group who contributed to progress in an industry by developing an outstanding domestic technology; and in 2012, it was awarded the Prize for Science and Technology (Development Category) by the Minister of Education, Culture, Sports, Science and Technology.

Simultaneous Acquisition of Multiple Information Items

Using expertise cultivated for automotive products, Panasonic also offers a variety of high-precision sensors. Pressure sensors for home appliance products (Fig. 3) are one of them. For example, they are applied to anomaly detection systems for the pressurization mechanism of cassette-type coffee machines. These sensors detect pressure with high precision by electrically detecting the pressure-induced changes of the shape of very small diaphragms, which use Micro Electro Mechanical Systems (MEMS) technologies. Products with built-in compensation circuits, which eliminate the need for temperature characteristic adjustments, are also available.

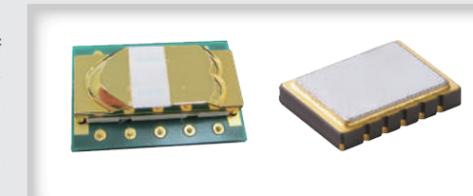
Panasonic also offers a unique sensor that is capable of simultaneously detecting multiple information items using infrared rays: Grid-EYE, an infrared array sensor (Fig. 4). It has a built-in array sensor consisting of 64 sensors lined up on a two dimensional area (8x8) that detect infrared rays radiated from people and objects. The sensor is capable of detecting the positions, number, etc., of people through software processing of output signals. It is adopted by systems that control air conditioners based on the number of people in the room, and has potential for security systems, care facility monitoring systems, and other systems. Panasonic intends to provide the infrared ray array sensor device together with signal processing software, when required, as a system solution.

Panasonic offers many other sensors (see separate columns) and aims to actively tap into applications for automotive, home appliances, and industrial device fields using its wide variety of products and strong user support. The company must be a reliable partner for designers who work on developing new systems using sensors.

A variety of products made use of designer's idea

Other than above introduced, Panasonic provides many sensors such as Magnetic Sensor detects rotational angle using Magneto Resistive Elements(MR Element), Accelerated Sensor achieved high reliability with its static capacitance structure, Lighting Sensor NaPiCa achieved spectral response with multilayer film technology. Based on these key technologies, the

company focuses the effort on composition and modularization of sensor devices to respond to the safety and environment needs in automotive application such as inertia, pressure, torque, gas, fuel, and human detection etc. and to target ADAS and automatic driving. In future, Panasonic responds to customer's various needs by providing solution proposal and



support in accordance with high performance devices and relieving field designers' burdens.